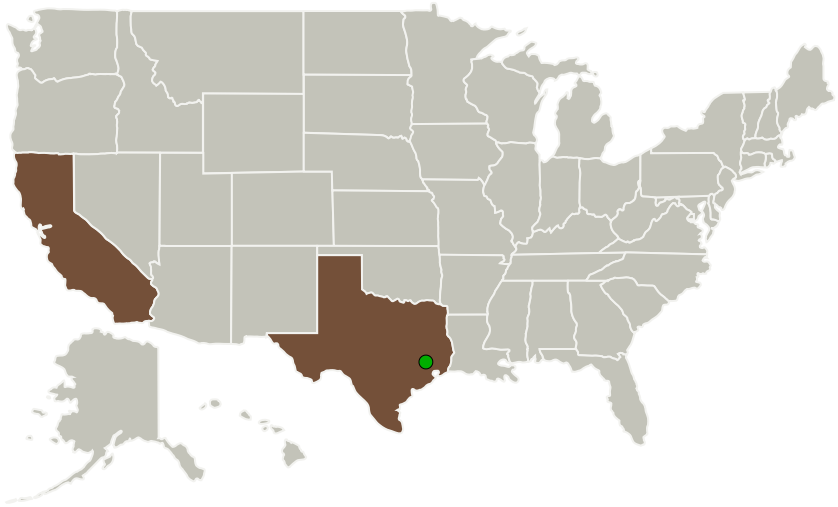
A Flight-like Integrated Circulator for Broad Area Cooling, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Future instruments and platforms for NASA space applications will require increasingly sophisticated thermal control technology, and cryogenic applications will become increasingly more common. For example, the Single Aperture Far-IR (SAFIR) telescope and other cryogenic telescope missions must provide distributed cooling and multiple heat lift. Also, the management of cryogenic propellants requires distributed cooling through integrated heat exchangers for zero boil-off, densification and cooling of structural members. To address these requirements, we propose to develop a lightweight, continuous-flow cooling loop that can provide cooling and temperature control to multiple, distributed and broad area loads. This approach allows relatively simple mechanical and electrical integration and maintains high refrigeration system efficiency. The basis of the loop is a set of cold check valves that converts the oscillating pressure, which characterizes the operation of regenerative cryocoolers, into a quasi-steady pressure difference that can be used to drive a continuous flow of cold gas over distances of several meters. This Integrated Circulator (IC) has the potential secondary benefit of rapid and therefore precise load temperature regulation of multiple sensors or structures using actively controlled throttle valves to regulate the local gas flow.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Atlas Scientific	Lead Organization	Industry	San Jose, California
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
California	Texas

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137816)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Atlas Scientific

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

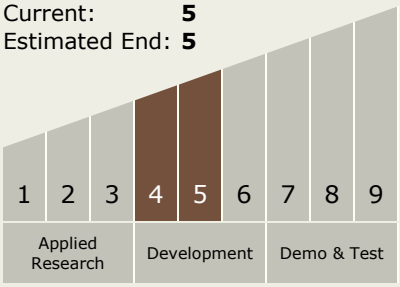
Carlos Torrez

Principal Investigator:

James Maddocks

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System